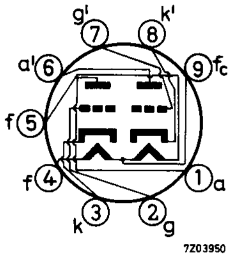
S.Q. TUBE

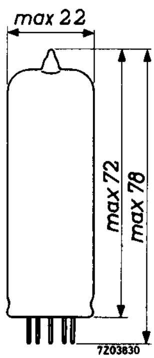
Special quality double triode designed for use as A.F. and D.C. amplifier.

QUICK REFERENCE DATA				
Life test	10 000 hours Low interface resistance after long periods of operation under cut-off conditions			
Mechanical quality	Shock and vibration resistant			
Base	Noval. Gold plated pins			
Heating	Indirect A.C. or D.C. Series or parallel supply			
Heater voltage	V_f	12.6	6.3	V
Heater current	I_f	0.3	0.6	A
Anode voltage	V_a		250	V
Grid voltage	V_g		-5.5	V
Mutual conductance	S		2.7	mA/V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





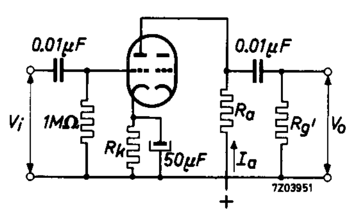


Fig.1

CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	12.6			V
Heater current	I_f	300	285 - 315		mA
Anode voltage	V_a	250			V
Cathode resistor	R_k	920			Ω
Anode current	I_a	6.0	5.4 - 6.6	min. 4.3	mA
Transconductance	S	2.7	2.2 - 3.2	min. 1.8	mA/V
Amplification factor	μ	27			
Internal resistance	R_i	10	min. 7		kΩ
Negative grid current	$-I_g$		max. 0.5	max. 1.0	µA
Difference in anode current of two sections	$\|I_a - I_a'\|$		max. 3.0		mA
Anode voltage	V_a	250			V
Negative grid voltage	$-V_g$	5.5			V
Cut-off voltage	$-V_g$	17			V
Anode voltage	V_a	250			V
Anode resistor	R_a	1			MΩ
Anode current	I_a		max. 15		µA
Hum voltage Grid resistor R_g = 0.5 MΩ	V_g		max. 75		μV_{RMS}
Leakage current between cathode and heater Voltage between cathode and heater V_{kf} = 120 V	I_{kf}		max. 12		µA
Cathode heating time		16	max. 23		sec
Cathode cooling time			min. 13		sec

CAPACITANCES

		External screen		Without external screen		
		I	II	I	II	
Anode to cathode and heater	$C_{a/kf}$	3.5	2.8 - 4.2	0.45		pF
Grid to cathode and heater	$C_{g/kf}$	2.6	1.9 - 3.3	2.4		pF
Anode to grid	C_{ag}	3.0	2.4 - 3.6	3.1		pF
Grid to heater	C_{gf}		max.0.23		max.0.23	pF
Cathode to heater	C_{kf}	4.8		4.8		pF
Anode to cathode and heater	$C_{a'/k'f}$	3.0	2.3 - 3.7	0.55		pF
Grid to cathode and heater	$C_{g'/k'f}$	2.6	1.9 - 3.3	2.4		pF
Anode to grid	$C_{a'g'}$	3.0	2.4 - 3.6	3.0		pF
Grid to heater	$C_{g'f}$		max.0.23		max.0.23	pF
Cathode to heater	$C_{k'f}$	4.8		4.8		pF
Anode to anode other section	$C_{aa'}$	1.3	0.9 - 1.7	1.45		pF
Grid to grid other section	$C_{gg'}$		max. 13		max. 13	mpF
Anode to grid other section	$C_{ag'}$		max. 0.1		max. 0.1	pF
Grid to anode other section	$C_{ga'}$		max. 65		max. 65	mpF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) under the following conditions during 10 000 hours.

Heater voltage	V_f	6.3	V
Anode voltage	V_a	250	V
Cathode resistor	R_k	920	Ω

LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max.	600	V
	V_a	max.	300	V
Anode dissipation	W_a	max.	2	W
Cathode current	I_k	max.	12	mA
Cathode current peak value	I_{k_p}	max.	150	mA
Grid current peak value max. 30 mA				
Duty factor max. 0.005				
Pulse duration max. 10 μs				
Cathode current peak value	I_{kp}	max.	30	mA
Grid current peak value max. 2 mA				
Duty factor max. 0.2				
Pulse duration max. 400 μs				
Grid voltage	$-V_g$	max.	200	V
Grid current, average value	I_g	max.	0.3	mA
peak value	I_{g_p}	max.	30	mA
Voltage between cathode and heater	V_{kf}	max.	120	V
Bulb temperature	t_{bulb}	max.	170	^{o}C
Grid resistor (automatic bias)	R_g	max.	1	MΩ
Grid resistor (fixed bias)	R_g	max.	0.5	MΩ

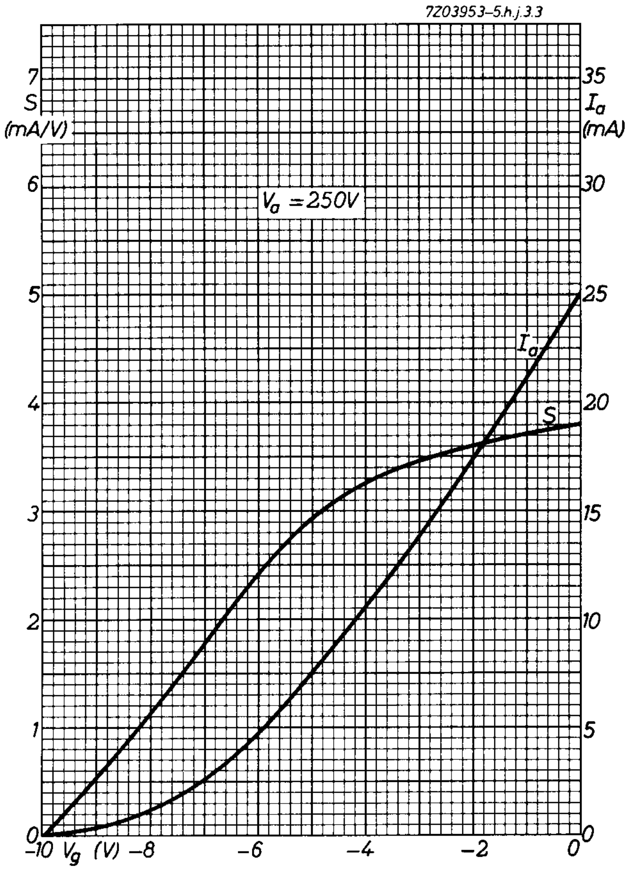
Heater voltage. The average heater voltage should be 6.3 V or 12.6 V. Variations of the heater voltage exceeding the range of 6.0 V to 6.6.V or 12.0 to 13.2 V will shorten the tube life. The tolerance of heater current (column II) should be taken into account.

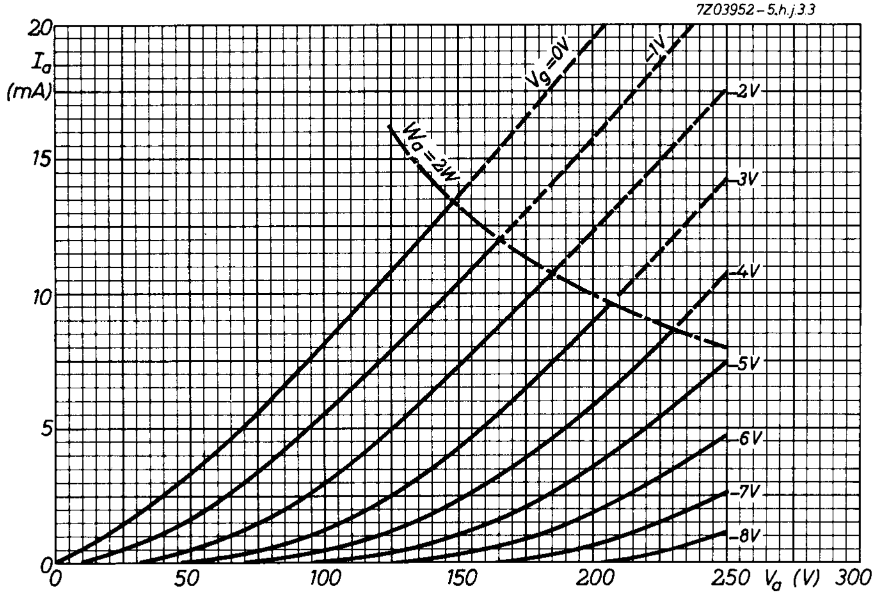
OPERATING CHARACTERISTICS

Resistance coupled A.F. amplifier. Fig.1 page 1

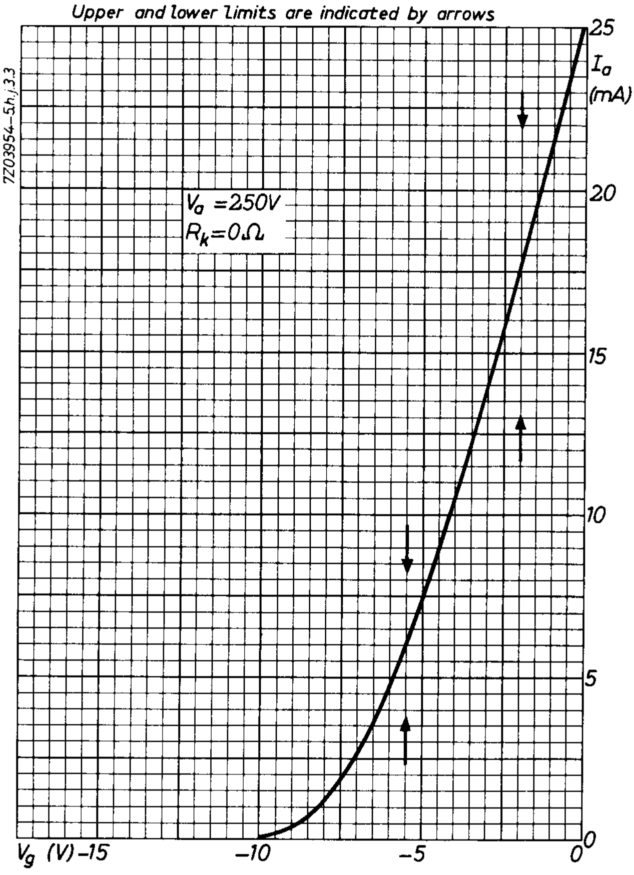
Anode supply voltage	V_{b_a}	200	250	300	350	400	V
Anode resistor	R_a	47	47	47	47	47	kΩ
Cathode resistor	R_k	1.2	1.2	1.2	1.2	1.2	kΩ
Grid resistor	R_g'	0.15	0.15	0.15	0.15	0.15	MΩ
Anode current	I_a	1.86	2.45	3.15	3.80	4.40	mA
Voltage gain	V_o/V_i	18.5	18.5	18.5	18.5	18.5	
Output voltage at $+I_g = 0.3\,\mu A$	V_o	20	30	40	50	60	V_{RMS}
Total distortion 1)	d_{tot}	3.3	3.8	4.0	4.1	4.2	%
Anode supply voltage	V_{b_a}	200	250	300	350	400	V
Anode resistor	R_a	100	100	100	100	100	kΩ
Cathode resistor	R_k	2.2	2.2	2.2	2.2	2.2	kΩ
Grid resistor	R_g'	0.33	0.33	0.33	0.33	0.33	MΩ
Anode current	I_a	1.00	1.30	1.65	1.95	2.30	mA
Voltage gain	V_o/V_i	20	20	20	20	20	
Output voltage at $+I_g = 0.3\,\mu A$	V_o	22	32	42	52	63	V_{RMS}
Total distortion 1)	d_{tot}	3.1	3.4	3.5	3.6	3.7	%
Anode supply voltage	V_{b_a}	200	250	300	350	400	V
Anode resistor	R_a	220	220	220	220	220	kΩ
Cathode resistor	R_k	3.9	3.9	3.9	3.9	3.9	kΩ
Grid resistor	R_g'	0.68	0.68	0.68	0.68	0.68	MΩ
Anode current	I_a	0.52	0.67	0.83	0.99	1.15	mA
Voltage gain	V_o/V_i	21	21	21	21	21	
Output voltage at $+I_g = 0.3\,\mu A$	V_o	19	29	38	47	58	V_{RMS}
Total distortion 1)	d_{tot}	2.3	2.6	3.0	3.1	3.2	%

1) At lower output voltages the distortion is proportionally lower.


7Z03953-5.h.j.3.3
S
(mA/V)
I_a
(mA)
V_a = 250V
I_a
S
7
6
5
4
3
2
1
0
35
30
25
20
15
10
5
0
-10 V_g (V) -8
-6
-4
-2
0



7Z03952-5.h.j.3.3
20
I_a
(mA)
15
10
5
0
0
50
100
150
200
250
V_a (V)
300
Vg=0V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
-8V
Wa=2W



Upper and lower limits are indicated by arrows
7Z03954-5.h.j.3.3
V_a =250V
R_k=0Ω
25
I_a
(mA)
20
15
10
5
0
V_g (V) −15
−10
−5
0

PHILIPS

Data handbook

Electronic components and materials

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